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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HESSELTINE, RYAN J	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/546,213	WATANABE ET AL.	
	Examiner	Art Unit	
	Ryan J Hesseltine	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/5/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments on page 8, first paragraph, filed September 7, 2004, with respect to claims 1, 2 and 13, have been fully considered and are persuasive. The objections to claims 1, 2 and 13 have been withdrawn.

2. Applicant's arguments on pages 6-13, filed September 7, 2004, with respect to the rejection(s)of claim(s) 1-12 and13 under 35 U.S.C. 103(a) and 35 U.S.C. 102(e), respectively, have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Spight (USPN 4,462,046, newly cited).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3, 4 and 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight (USPN 4,462,046, newly cited) in view of Corby, Jr. et al. (USPN 5,745,387, newly cited, hereafter Corby).

5. Regarding claims 1 and 8, Spight discloses a teaching model generating method and device for image processing, in which a subject object has the same or substantially similar shape as that of a reference object (column 1, line 7-12), the device comprising: an image processing system with which current three-dimensional orientation of the subject object relative to an

image pickup device is recognized based on a plurality of predetermined teaching models (stored data of desired object) of the reference object (column 3, line 26-47; column 8, line 10-15); and an image-capture system (video detector 40, Figure 1; column 5, line 42-48), in advance of the recognizing, generating and storing the plurality of teaching models (reference signals) on the basis of respective image data produced by taking images of said reference object from a plurality of directions, so that the image data respectively obtained at each of said different image pickup positions, is stored as a teaching model (reference signal) (column 9, line 1-19). Spight does not disclose that one of the reference object and said image pickup device is fixed to a movable and positionable part of the robot or is grasped with a hand of the robot, that said robot is operated for positioning to a plurality of different image pickup positions and directions, or that direction information indicating the respective different direction is stored with the image data as a teaching model.

6. Corby discloses an augmented reality maintenance system employing a manipulator arm with an archive and comparison device wherein a distal end 100 of the manipulator arm 10 is attached to a utility package 11, which may include a spatial imaging device such as a video camera (Figure 1; column 4, line 18-33). Corby also discloses a position and attitude sensing unit 21 to determine the position and orientation distal end 10b, which can then be used by manipulator arm renderer 33 to create several images of a prestored model of the manipulator arm from model storage 47 from several different viewpoints and environment renderer 35 to produce a number of images of the environment corresponding to supplied viewpoints (column 4, line 34-65). Corby goes on to disclose an archive and comparison device 50 that utilizes a sensor data storage device 51 capable of storing spatial imagery with location, orientation and

acquisition parameters linked to each image (column 6, line 29-37). It would have been obvious to one of ordinary skill in the art at the time the invention was made to fix an image pickup device to a movable and positionable part of a robot, operate the robot for positioning to a plurality of different image pickup positions and directions, and store direction information indicating the respective different direction with the image data as a teaching model as taught by Corby in order to define the identity of the site imaged, when it was imaged, the viewpoint, the modality of the imager and description of values relating to the image (column 6, line 37-51).

7. Note also that Spight does not explicitly disclose that the recognized current orientation of the subject is three-dimensional (determine object's position and orientation in space; column 8, line 10-15) and Corby only mentions it in passing (column 2, line 6-12; column 8, line 41-45). The examiner takes Official Notice that determining three-dimensional orientation of an object is well known in the art of robotic vision systems. It would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the three-dimensional orientation of an object in order to determine the orientation at which to pick up an object.

8. Regarding claim 3, Spight discloses that said teaching model is a part of the image data of the reference object (column 9, line 10-19; column 10, line 50-63).

9. Regarding claim 4, Spight discloses that said teaching model comprises data obtained by performing image processing on the image data of the reference object (column 9, line 10-19; column 10, line 50-63).

10. Regarding claims 9 and 12 (see above discussion of claim 1), Spight discloses a method of automatic orientation recognition, comprising: generating and storing a set of images of different relative orientations (arrangements; claim 12) of a subject (column 9, line 1-19), the

images having been captured by a plurality of robotic operations corresponding to the different relative orientations (arrangements) of the subject (Corby; column 4, line 43-65), and associating with each image information indicating its respective relative orientation (arrangement) of the subject (Corby column 6, line 29-51); after the generating and storing, from a known current orientation (arrangement) of (an image pickup device on) a robot, capturing a current image of a workpiece that has an unknown orientation (arrangement) relative to an image pickup device on the robot (Corby; column 4, line 18-33) (before the robot has come into contact with the workpiece; claim 9 only), where the workpiece has a shape substantially similar to the shape of the subject (Spight; column 3, line 29-38; column 6, line 11-13); after the capturing, using pattern matching (correlation) to match one of the stored images with the current image (column 7, line 28-column 8, line 15; column 9, line 59-column 10, line 11); and after the pattern matching, (and before the robot has come into contact with the workpiece; claim 9 only), determining the orientation (arrangement) of the workpiece relative to the image pickup device on the robot based on the relative orientation (arrangement) information associated with the matched stored image (reference signal), and also based on the known current orientation (arrangement) of the robot (column 8, line 16-37; column 11, line 21-38).

11. Regarding claim 10, Spight discloses automatically maneuvering the robot to the workpiece based at least on the determined orientation of the workpiece relative to the robot (column 8, line 16-37).

12. Regarding claim 11, Spight discloses that the generating and storing is performed for a plurality of differently shaped subjects (store a plurality of configurations of each desired object; column 9, line 1-19), wherein the current image includes a plurality of differently shaped

workpieces, and wherein the pattern matching further comprises identifying workpieces from among the plurality of differently shaped workpieces using the images and orientation information of the plurality of differently shaped subjects (column 6, line 11-13; column 7, line 50-column 8, line 15; column 11, line 29-38).

13. Regarding claim 13 (see above discussion of claim 1), Spight discloses a method comprising: robotically taking images of a subject with different three-dimensional subject-camera arrangements that vary in three dimensions (column 9, line 1-19; Corby, column 4, line 17-33), and associating with each image or data thereof information indicating its subject-camera arrangement (Corby, column 6, line 29-51); then taking a current image of a workpiece shaped like the subject (Spight; column 3, line 29-38; column 6, line 11-13); and then before picking up the workpiece determining a current workpiece-camera orientation by matching (correlating) one of the images or data thereof with the current image (Spight, column 7, line 28-column 8, line 15; column 9, line 59-column 10, line 11), and using predetermined subject-camera arrangement information of the matched image to determine the three-dimensional orientation of the workpiece relative to the camera (Spight, column 8, line 16-37; column 11, line 21-38).

14. Claims 2, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight in view of Corby in view of Werth et al. (USPN 4,504,970, previously cited, hereafter Werth).

15. Regarding claim 2, Spight discloses a teaching model generating device for image processing, in which a subject object has same or substantially similar shape as that of a reference object, the device comprising: an image processing system with which a current three-dimensional orientation of the subject object relative to an image pickup device is recognized by

carrying out pattern matching processing of an image of the subject based on a plurality of pre-determined teaching models of the reference object; and an image capture system, in advance of the recognizing, generating and storing the plurality of teaching models on the basis of respective image data produced by taking images of said reference object from a plurality of directions, wherein said image pickup device is fixed to a movable and positionable part of a robot or is grasped with a hand of the robot, which is operated for positioning to a plurality of different relative image pickup positions and directions, so that the image data respectively obtained at each of said different image pickup positions is stored as a teaching model (see above discussion of claim 1).

16. Neither Spight nor Corby discloses that the reference object is fixed to a movable part of a first robot or is grasped with a hand of the first robot. Werth discloses a training controller for pattern processing system wherein it is suggested that an application could utilize two robot arms, one which holds a camera which visually guides it to observe a precise assembly point and a second which brings a tool or assembly within the visual field of the camera where it is visually guided through an operation (column 5, line 12-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize two robot arms, one to hold a camera and one to hold a tool or assembly as taught by Werth in order to provide more degrees of freedom allowing more views of the workpiece from different directions and to provide proper alignment for mating parts in automated assembly operations or move a tool to a specific point on the part (column 5, line 6-11).

17. Regarding claim 5, Spight discloses that said teaching model is generated for every direction in which said image pickup device took the image of said reference object (column 9,

line 1-19) and Corby discloses that said teaching model is stored in association with the information on the direction (column 6, line 29-41).

18. Regarding claim 6, Spight discloses that said image pickup device 40 is a camera (column 5, line 42-48).

19. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spight in view of Corby in view of Werth as applied to claim 2 above, and further in view of Ninomiya et al. (USPN 4,611,292, previously cited, hereafter Ninomiya).

20. Spight, Corby nor Werth disclose that said image pickup device is a three-dimensional visual sensor that measures a distance between the image pickup means and a plurality of points on the object. Ninomiya discloses a robot vision system including a three-dimensional visual sensor whose image pickup means measures the distance between the image pickup means and a plurality of points on the object (column 4, line 28-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a three-dimensional visual sensor as taught by Ninomiya in order to determine the position and posture of an object without operation or accuracy being effected by contrast, color, or surface condition of the object (column 10, line 35-39).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ryan J Hesseltine whose telephone number is 703-306-4069. The examiner can normally be reached on Monday - Friday, 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Ryan J. Hesseltine
January 18, 2005

JINGGE WU
PRIMARY EXAMINER